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Statement by Jim Williams
Deputy Secretary of Agriculture

before the

Committee on Energy and Natural Resources
Honorable Henry M. Jackson, Chairman
United States Senate

February 6, 1980

Mr. Chairman and Members of the Committee, it is a pleasure to appear before you today to discuss energy programs of the Department of Agriculture, with specific emphasis on alcohol fuels.

A great deal of interest today regarding energy in agriculture is in the production of alcohol fuels. Before discussing alcohol fuels, I would like to put into perspective the importance of energy in agriculture, forestry and rural America by briefly discussing energy usage in those sectors, energy conservation efforts of the USDA, and activities with regard to wood energy and forestry. I will then conclude my statement with a discussion of alcohol fuels.

I. Energy Usage in Agriculture, Forestry
and Rural America

In 1978, an estimated 13.8 quads of energy were used in agricultural and forestry production and processing, rural housing, and rural vehicular use (table 1). This represents about 18 percent of the total energy used in the U.S.

Of the total energy used in agricultural production, 93 percent was derived from petroleum based energy. In forestry and rural housing, these percentages were 51 and 71, respectively.

Table 1

Energy Used in Agriculture, Forestry,
and Rural America, 1978

<u>Sector</u>	<u>Quads</u>	<u>Percent derived from petroleum resources</u>	<u>Percent of U.S. total</u>
Agricultural Production	2.5	93	3.2
Food Processing	1.0	84	1.3
Forestry	2.7	51	3.5
Rural Housing	3.1	71	4.0
Rural Vehicular Use	<u>4.5</u> 13.8	<u>100</u> 82	<u>5.8</u> 17.8

These data indicate the significant dependency of agriculture and rural America on petroleum based energy. Of the total 78 quads of energy used in the U.S. in 1978, about 74 percent was from petroleum products. Therefore, the rural areas are substantially more dependent on petroleum fuels than the United States as a whole.

In view of this large dependence of agriculture, forestry, and the rural sector on petroleum energy and the necessity for adequate sources of energy on a timely basis, Secretary Bergland has placed a major emphasis upon energy conservation and energy production from biomass materials.

II. Energy Conservation

Primary areas of energy conservation in agricultural production include: minimum or reduced tillage; improved irrigation efficiency; additional soil testing for more accurate application of fertilizers; and crop drying. The Science and Education Administration (SEA) and Soil Conservation Service (SCS) are primarily responsible for research and development in the conservation area. State and local offices of SEA-Extension, SCS, and the Agricultural Stabilization and Conservation Service (ASCS), are largely responsible for disseminating information and technology to farmers and rural residents.

USDA estimates 72 million acres of cropland were minimum tilled in 1979, and 8 million acres were farmed without tillage. Thus, conservation tillage was used on one-fourth of the cropland in 1979, saving 2.5 gallons per acre, or a total of 200 million gallons of petroleum.

Irrigation consumes about 20 percent of the total energy used in agricultural production. Research efforts are ongoing within USDA to develop more efficient irrigation machinery, improved water management methods and practices, and more drought-resistant varieties of crops.

In 1978, fertilizer comprised about one-third of the energy used in agricultural production. Increased and more accurate soil testing can result in optimum applications of fertilizer. This will result in larger yields per acre and per unit of fertilizer used, and can decrease the amount of petroleum motor fuels used in cropping activities.

Although energy used in crop drying represents only about 3 percent of the total used in agricultural production, a large portion can be saved by conservation and substitution of other types of energy sources, including direct solar. The ASCS makes loans to farmers for the installation of solar collectors for grain drying and multi-purpose uses. In 6 months some 12 loans totaling \$77,000 were made.

Most of the energy conservation potential in the forestry sector is in forest product manufacturing, where 93 percent of the total energy use in the industry occurs. Annually, about 35 percent of the total energy consumed in manufacturing is derived from wood residues. This will increase as more firms utilize additional quantities of residues to displace fuel oil and natural gas.

The Rural Electrification Administration is implementing a new energy conservation program to all borrowers submitting loan applications. Beginning January 1980, borrowers are required to document their in-house energy conservation programs and to provide to their end users information on efficient energy use and conservation.

There are approximately 23 million housing units located in the rural United States. In 1977, about 50 percent of these homes had all windows and doors covered with storm units. About 78 percent had at least some attic insulation.

The USDA, through the Farmers Home Administration, has rural home energy conservation programs designed for existing units and energy efficiency and conservation standards which must be met prior to approval of loans for new units.

In 1977, the USDA initiated a program for retrofitting existing rural homes with energy saving measures. This program allows local electric cooperatives to accept and process Farmers Home Administration rural housing loan applications to assist low-income members of the cooperatives to weatherize their homes. Since its inception, over 1,500 loans for about \$1.4 million have been made.

In 1979, the loan assistance program from FmHA provided funds for construction of 173,470 new rural housing units at a funding level of about \$4.3 billion. The energy efficiency and conservation standards in these new homes are primarily in the areas of insulation and design guidelines.

The Farmers Home Administration placed into effect on July 1, 1978, mandatory "thermal performance standards" covering basic requirements for insulation, storm windows, caulking, heating and cooling, equipment standards, and other energy saving components for all FmHA-assisted new housing construction. These standards are the most stringent of any federal home-financing agency, and should have a substantial spin-off impact on privately-financed housing construction in addition to the approximately 150,000 units per year assisted by the FmHA.

In addition to the mandatory thermal standards, the FmHA is preparing designs for a basic three bedroom house which incorporates "passive" solar energy criteria and other energy saving features, including entry vestibules, proper overhangs for sun control, generous insulation, provision for a wood stove, and other features. These specifications will be made available through county FmHA offices, so that they can be incorporated into new housing construction on a voluntary basis in geographical locations and situations where particular features are suitable.

The FmHA is currently developing a home "energy indexing" system which can be used to rate the energy efficiency of the heating and cooling system and the construction features of specific house plans. This should provide additional incentives for buyers, builders, and lenders to construct and purchase homes that are energy efficient.

These measures that apply entirely or primarily to new housing construction--mandatory insulation standards, additional voluntary guidelines, and the home energy index--can be expected to produce savings in energy consumption by rural households during the 1980's. They are being developed and implemented by the USDA in cooperation with the Department of Energy, Department of Housing and Urban Development, and other agencies, and at the same time reflect the different characteristics of rural compared to urban housing.

No attempt is made here to quantify the amount of savings of energy expected to occur by 1990, partly because these measures have a generalized impact which is difficult to isolate from the impact of similar measures by DOE and HUD and of generic tax credits for weatherization practices.

Vehicle use in rural areas represented almost 6 percent of the total energy used in the U.S. during 1978. To comply with the Emergency Energy Conservation Act, the USDA is cooperating with DOE and other Federal agencies in establishing energy conservation, allocation, and rationing plans designed to reduce consumption of motor fuels. The extent to which motor fuel consumption can be reduced in rural areas is somewhat limited in the near term because alternative modes of transportation are scarce or non-existent.

This testimony has only highlighted some of USDA's activities in energy conservation.

III. Fuel From Wood

In order to place energy conservation and production in agriculture, forestry, and rural America in proper perspective, it is important to understand the use and potential use of wood for fuel.

Currently, about 35 percent of the total energy used in producing and processing forest products is from wood and forest residues. This represents about .9 quads of energy. Another .2 quads of fuelwood is used for residential heating, so that fuelwood use currently totals about 1.1 quads annually.

There is a large potential for expanded usage of wood for fuel. Total wood potentially available now in the United States, on an annual renewable basis, is roughly 9 quads in fuel-equivalent terms. Of this, some 3.8 quads (42 percent) is currently harvested and used for lumber, other manufactured wood products (2.7 quads), or for fuelwood (1.1 quads). This means that another 5.2 quads (58 percent of the total resource) which is potentially available annually is left unharvested and unused.

The economics of harvesting and using a substantial portion of this currently unused wood is becoming favorable, as the price of oil, gas, and other competitive fuels increases. The pulp and paper mills alone currently use some 2.4 quads of fuel annually; 1.5 quads of this is purchased fuel and the remainder (.9 quads) is wood in the form of mill residues. The pulp and paper industry can be expected (with appropriate incentives) to replace the predominant portion of its purchased energy with wood over the next few years. The use of fuelwood for residential heating and for other industries and utilities (textiles, brick

manufacturing, small power plants, etc.) should also expand in the short term.

Wood of course is not itself a liquid fuel unless converted, but many new applications of wood could be expected to "back out" petroleum based liquids and natural gas. For instance, approximately 43 percent of the 1.5 quads of energy purchased by pulp and paper mills is either middle distillates or residual fuel oil, which represents roughly 13 billion gallons (310 million barrels) of liquid fuel. About 71 percent of the heating fuel for rural residences is petroleum based, and reliance upon middle distillates is much higher in New England, for instance, where fuelwood is potentially available as a substitute for home heating oil.

Through the National Forest System free-use fuel wood program, the growth in permits issued has grown from about 64,000 in 1973 to almost 370,000 in 1978. This represents an increase in wood utilization to about 3.7 million tons in 1978 or the equivalent of about 9 million barrels of oil.

The nationwide sale of wood burning stoves numbered about 1.1 million units in 1978. This represents an increase in wood use of from 3.5 million tons which is roughly equivalent to 7.5 million barrels of crude oil. It has been estimated that an additional 1.5 million wood burning stoves were sold in the U.S. during 1979 and the wood used could equal 9 million barrels of crude oil.

Two wood-fired utility plants in New England are now producing electricity for distribution to consumers. In addition, two REA member cooperatives are currently investigating the feasibility of building and operating wood-fired power plants.

While the direct combustion of wood is limited to stationary uses and therefore does not directly displace petroleum fuel in the transportation sector, the expanded use of wood promises to free up greater quantities of fuel liquids in the short term than the conversion of agricultural commodities into alcohol fuels. The 13 billion gallons of diesel and residual fuel oil used in pulp and paper plants for example, most of which is used in stationary plants, can be compared to the 500 million gallons of fuel alcohol targeted for production during 1981. We of course need to produce the alcohol fuel, but fuel wood as replacement for fuel liquids should not be de-emphasized.

The Carter Administration has supported the energy investment tax credit and other tax incentives for the conversion of manufacturing plants to wood and other non-petroleum sources of energy, and is supporting an additional \$3 billion of loans and loan guarantees for biomass energy production and use (including wood energy) in the pending Synfuels Bill. The Administration also supports tax credits for wood stoves. With these incentives, conversion to fuel wood should be economically attractive in an increasing number of locations.

The USDA, primarily through the Forest Service, intends to carry out its management of the National Forest System and other forestry programs so as to accommodate, to the extent possible consistent with other purposes and objectives, the availability and use of wood for energy as replacement for oil and other priority fuels.

IV. Alcohol Fuels

Both the President and Congress have emphasized the use of ethanol in near-term national energy policy. We at USDA are fully committed to focusing the resources available to the Department for production and use of fuel-grade ethanol from agricultural materials, as a part of the President's program on alcohol fuels and consistent with our other responsibilities.

The President's recently-announced gasohol program for 1980-1990 calls for 500 million gallons of alcohol fuels capacity to be in place by the end of 1981. About 80 million gallons of annual on-line capacity currently exists; 420 million gallons of additional capacity is therefore necessary to reach the President's goal.

The most important single action necessary at this time to achieve the alcohol fuels production goals is passage of the excise and income tax credits in the Oil Windfall Profits Tax Bill currently pending in Senate-House Conference. The President has recommended that the 4 cents

per gallon Federal gasoline excise tax exemption for gasohol be made permanent, and the Administration also supports the 40 cents per gallon income tax credit for alcohol greater than 190 proof (30 cents per gallon for 150-190 proof alcohol) for ethanol produced and used for fuel on farms. These are powerful incentives for ethanol production--the equivalent of \$16.80 per barrel of oil. The optional excise or income tax credits will provide balanced incentives which will provide roughly equal assistance for gasohol blends and for lower-proof alcohol produced on farms or by local cooperatives.

It is crucial that the excise and income tax credits be extended beyond the current October 1, 1984, expiration date for the gasoline excise tax exemption. If the tax credits were extended through 1999 as provided in the Senate version of the Windfall Profits Tax Bill, firms and investors considering investments in alcohol fuel plants can expect the return from the tax credits to be available essentially for the amortized life of a new plant.

If these and other Federal incentives are enacted in the pending Windfall Profits Tax Bill and Synfuels Bill, our calculations indicate that, on a pro forma basis, investment in new plant and equipment for fuel ethanol production can show an attractive financial return. Specifically, with \$2.50 per bushel corn as feedstocks and other assumptions, a properly-managed, newly-constructed alcohol fuels plant of 40 million gallon

annual capacity might be expected to yield a 20-25 percent return on investment. The basic calculations for this are contained in Attachment A to this statement.

The economics of fuel alcohol production can be strengthened by site-specific factors, particularly where the co-products of alcohol production can be increased in value or where production costs can be reduced.

For instance, the integration of an anhydrous alcohol distillery with a corn wet milling plant can result in production efficiencies and higher co-product returns (for corn oil, high-protein gluten feed, etc.). The co-location of a distillery with a cattle feedlot can allow the high-protein byproduct to be fed wet, thus saving large amounts of fuel otherwise required for drying the byproduct feed. Similarly, co-location with a cooperative grain elevator can save grain handling costs, co-location with an electrical power plant can use "waste" heat from the power plant, etc.

As a followup to the President's January 11 announcements on alcohol fuels, the Department of Agriculture on January 19 designated \$100 million of Rural Business and Industry loan guarantee authority of the Farmers Home Administration to assist the construction and operation of alcohol fuel plants. In extending these loan guarantees, we will attempt to target loan guarantees on firms and persons who can take advantage of the kinds of site-specific factors noted earlier. We are

conducting assessments of opportunities for integrated operation of alcohol plants with corn milling plants, animal feedlots, grain elevators, power plants, and other such opportunities. The B&I Loan Program is based upon FmHA's rural development mission and functions without a "no credit elsewhere" clause.

We estimate that the distillation plant construction assisted by these loan guarantees could provide about 25 percent of the new capacity needed to reach the goal of 500 million gallons of capacity during 1981.

Also as a part of the President's program on alcohol fuels, the Department of Agriculture is carrying out its agricultural commodity and other programs with a view toward accommodating, to the extent possible consistent with the Department's related responsibilities in food and agricultural policy, the feedstock requirements of alcohol fuel plants. For instance, grain reserve programs, set aside and land diversion programs, and others are administered intentionally to accommodate alcohol fuel production.

The Department's research efforts are being similarly adapted to support alcohol fuels production. Perhaps the most important single area for research is the reconstitution of livestock rations to accommodate the increased production of high-protein feed supplement which results from ethanol production from corn. Economic research on agricultural land

availability and use patterns is also crucial. The Science and Education Administration and the Economics, Statistics, and Cooperatives Service of USDA are placing special emphasis on these and other research and development problems associated with alcohol fuels production on a large scale.

The USDA is also conducting research on the more efficient conversion of fuel alcohol from starch and sugar commodities, and from cellulosic feedstocks. The research and testing to increase yields and reduce costs associated with cellulosic materials is particularly necessary, in order to reduce the need for grain and other commodities for feedstocks during the 1980's. The work on cellulose is conducted primarily at USDA's Northern Regional Research Laboratory in Peoria, Illinois, and is carried out in cooperation with work by DOE and the private sector.

The USDA is also expanding its activities in on-farm and small-scale fuel alcohol production, as a part of the President's program. We have placed special emphasis upon technical assistance to this date, because of the problems of design, marketing, safety, and others that must be handled for successful operation of distilleries at the farm and community level. The Cooperative Extension Service in the various States has prepared instructional materials, conducted seminars, and provided individualized assistance to those interested in local production. In about a week, we will have available for public distribution, and for use by Extension personnel, State and county Farmers Home Admin-

istration offices, ASCS State and county offices, and others, a comprehensive technical manual on small-scale fuel alcohol systems prepared by Development Planning Research Associates (DPRA, Inc.) of Manhattan, Kansas. This will provide a firmer factual basis for our technical assistance efforts.

USDA loan assistance for small-scale ethanol production is currently available primarily through the Farm Operating loan programs of the Farmers Home Administration. Thus far, some \$10 million has been designated for direct and insured loans for small-scale ethanol plants during FY 1980. The FmHA has approved several applications for distilleries, ranging in size from 250,000 to 2,500,000 gallons of annual capacity. Approvals to this date have been limited to circumstances where the project shows sound promise for successful plant construction, production, and marketing. This program contains a "no credit elsewhere" clause and other statutory restrictions.

In providing loan assistance for small-scale ethanol production on a broader basis, we want to make sure that it is done in a way that will provide options for use and marketing of the ethanol produced from small distilleries. Of particular concern is the extent to which it will prove technically and economically feasible to use non-anhydrous alcohol in farm tractors and other farm power equipment--especially since over 85 percent of power fuel use on farms is diesel.

Farmers have an option in that they may either provide grain or other feedstock to a community plant and withdraw needed anhydrous alcohol and distillers grain byproduct for use on their farm, with the remainder being sold for profit; or they could submit farm produced lower-proof alcohol to the community plant for upgrading into anhydrous alcohol for sale or for use on the farm. The amount of product they would receive would of course be based on the amount of grains or feedstock they supplied to the community plant.

If this kind of profit-sharing (or fuel-sharing) arrangement is to operate to the maximum benefit to the farmers involved, the community ethanol processing and upgrading plant should be organized on a genuine cooperative basis, whereby the affiliated farmers participate in management decisions, qualify for patronage dividends or other forms of profit-sharing, and otherwise directly share in the cooperative's management and returns. For this reason, we would expect to target loan and loan guarantee assistance primarily to cooperatively-organized enterprises.

The Department of Agriculture is now in the process of working out a program of financial and technical assistance to small-scale alcohol producers. Because ethanol may prove to be primarily marketable for blending with gasoline in automobiles, there ought to be facilities in place for the upgrading of lower-proof alcohol to anhydrous alcohol, prior to the widespread construction of on-farm stills with only lower-proof production capability.

For this reason, we, in cooperation with the Department of Energy, may target our initial lending assistance on "community" sized plants which have excessive anhydrous production capacity and therefore can upgrade farmer produced lower proof alcohol as well as produce anhydrous alcohol directly from unprocessed feedstocks.

The 3 billion dollar Federal loan and loan guarantees for synthetic fuels for biomass will also provide very substantial new incentives for alcohol production and use. This effort should assure the availability of sufficient capital, for small and medium size facilities including on-farm facilities, to achieve the President's alcohol fuel goals. It should provide Federal financial support for biomass energy facilities in the form of \$300 million annually in loan guarantees and direct Federal loans. The Administration is currently developing detailed specifications for this effort. These will be provided to the Congress as soon as they are available.

In conclusion, we in the Department of Agriculture vigorously support an alcohol fuels production effort, as a part of the President's energy program and in balance with energy conservation and other biomass energy production including fuels from wood.

This concludes my prepared statement, and I would be pleased to respond to questions.

ATTACHMENT A

Estimated End-of-1979 Economics of a 40 Million
Gallon Per Year Grain Alcohol Distillery
 (With Federal Subsidies Only)

	<u>Dec. 1979</u>
Feedstock costs (\$2.50/Bu. corn)	\$.98
Direct costs (fuel, labor, etc.)26
Indirect costs (administrative, marketing, plant overhead) . .	.10
Capital recovery (includes 15% ROE)*34
	<hr/>
TOTAL	\$1.68
Less distillers' dried grain byproduct credit (\$116/ton) . . .	-.38
	<hr/>
	\$1.30
Less Federal Gasoline Tax credit	-.40
Less Other Federal incentives (investment tax credit; entitlement credit)	-.08
	<hr/>
NET PRODUCTION COST PER GALLON OF ETHANOL	\$.82

	<u>Gasoline</u>	<u>Ethanol</u>
Refinery gate price on non-lead gasoline	\$.85	--
Octane credit10	--
	<hr/>	<hr/>
TOTAL	\$.95 -----	\$.82

ESTIMATED PROFIT PER GALLON ETHANOL, IN ADDITION TO 15% ROE** \$.13

*The capital recovery estimate assumes a 15 percent after tax return on equity, 70 percent equity financing, and 12 percent cost of credit. The 13 cents estimated profit per gallon, factored into capital recovery, would yield about a 20-25 percent after-tax return on equity. Additional state subsidies would increase the rate of return

** Return on Equity

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